

A Conceptual Partial Mediation Framework of AI-CRM Capabilities, Customer Engagement, and Customer Satisfaction in the Ministry of Interior, UAE

Nasser Khalifa Salem Alfalasi

Fakulti Teknologi Dan Kejuruteraan Mekanikal, Universiti Teknikal Malaysia Melaka,
Malaysia

Siti Nurhaida Khalil (Corresponding author)

Fakulti Teknologi Dan Kejuruteraan Mekanikal, Universiti Teknikal Malaysia Melaka,
Malaysia

E-mail: snurhaida@utem.edu.my

Received: July 1, 2026 Accepted: September 4, 2026 Published: September 14, 2026

doi:10.5296/ijssr.v14i3.24039 URL: <https://doi.org/10.5296/ijssr.v14i3.24039>

Abstract

Artificial intelligence has become a major driver of transformation in Customer Relationship Management (CRM) by enabling organizations to predict customer needs, automate service interactions, personalize communication, analyse customer feedback, and improve decision-making. In public-sector institutions, AI-enabled CRM is increasingly important because citizens, residents, businesses, visitors, and other service users expect government services to be efficient, responsive, secure, transparent, and customer-centred. This paper develops a conceptual partial mediation framework of AI-CRM capabilities, customer engagement, and customer satisfaction in the Ministry of Interior, UAE. The framework identifies five AI-CRM capabilities: predictive analytics, churn prediction and retention tools, chatbots and virtual assistants, personalization, and sentiment analysis. Customer satisfaction is positioned as the dependent variable, while customer engagement is introduced as the mediating variable. The framework is described as a partial mediation model because AI-CRM capabilities are expected to influence customer satisfaction directly and indirectly through customer engagement. The paper contributes to AI-CRM literature by contextualizing AI-enabled customer relationship management within the UAE public-sector environment and by explaining how customer engagement strengthens the relationship between AI-CRM capabilities and customer satisfaction. It also provides a conceptual basis

for future empirical testing and practical guidance for improving AI-enabled public service delivery in the Ministry of Interior, UAE.

Keywords: AI-CRM, artificial intelligence, customer engagement, customer satisfaction, partial mediation, Ministry of Interior, UAE

1. Introduction

Customer Relationship Management has evolved from a traditional customer data-management function into a strategic, technology-enabled approach for improving relationships between organizations and their customers. In contemporary service environments, CRM supports the collection, processing, and use of customer information to improve service quality, retention, personalization, and customer satisfaction. With the rapid development of artificial intelligence, CRM systems have become more intelligent, predictive, automated, and customer centred.

AI integration into CRM enables organizations to understand customer behaviour, predict future needs, automate routine interactions, personalize service delivery, and analyse customer emotions. Ahmad and Pande (2024) explain that AI integration in CRM is reshaping how organizations manage customer relationships by improving decision-making, service responsiveness, and customer experience. Similarly, Chatterjee et al. (2019) argue that AI-CRM integration requires organizational readiness, technological capability, and strategic alignment to achieve effective outcomes.

In the public sector, the relevance of AI-CRM is increasing because government institutions are expected to deliver services that are fast, accessible, secure, transparent, and responsive. The Ministry of Interior, UAE, provides a suitable context for examining AI-CRM because it delivers essential services connected to public safety, policing, traffic, licensing, civil protection, emergency response, and citizen and resident services. Al-Mansoori (2023) highlights the importance of customer service dynamics in the daily operations of the UAE Ministry of Interior, while Almansoori and Al-Tahitah (2021) show that artificial intelligence already plays a role in decision-making processes within the Ministry.

In this study, the term “customer” is used in the public-sector sense. It refers to citizens, residents, businesses, visitors, and other users who interact with the Ministry of Interior’s services through digital platforms, mobile applications, call centres, service centres, and other official channels. Although CRM is often associated with private-sector customers, in this paper the concept is applied to public service users whose satisfaction, engagement, and trust are essential to effective government service delivery.

This paper proposes a conceptual partial mediation framework linking AI-CRM capabilities, customer engagement, and customer satisfaction in the Ministry of Interior, UAE. The model is described as partial mediation because AI-CRM capabilities are expected to affect customer satisfaction directly and also indirectly through customer engagement.

2. Literature Review

This section reviews the key concepts, theoretical arguments, and empirical studies related to artificial intelligence-enabled customer relationship management, customer engagement, and customer satisfaction. The review is situated within the public-sector context of the Ministry of Interior, UAE, where AI-enabled CRM can support service efficiency, proactive engagement, personalized communication, and improved customer satisfaction.

2.1 Artificial Intelligence in Customer Relationship Management

Artificial intelligence-enabled customer relationship management refers to the integration of AI technologies into CRM systems to improve the way organizations collect, analyse, interpret, and use customer data. Unlike traditional CRM systems, which mainly store customer information and support basic service processes, AI-enabled CRM allows organizations to automate interactions, predict customer needs, personalize services, identify dissatisfaction, support customer retention, and improve data-driven decision-making. These capabilities are increasingly important in-service environments where customers expect fast, accurate, accessible, and personalized support.

AI-CRM includes technologies such as machine learning, predictive analytics, natural language processing, chatbots, virtual assistants, recommendation systems, automation tools, and sentiment analysis. Dwivedi et al. (2021) explain that AI creates significant opportunities for organizations, particularly in improving decision-making, service innovation, and operational performance, while also introducing challenges related to ethics, governance, trust, and policy. Similarly, Ahmad and Pande (2024) argue that the integration of AI into CRM has transformed how organizations manage customer relationships by improving responsiveness, personalization, and customer experience. Raisch and Krakowski (2020) further emphasize that AI creates both automation and augmentation opportunities, meaning that AI can automate routine CRM activities while also supporting human employees in making better service and management decisions.

Recent studies show that AI-CRM contributes to service innovation, customer-centred value creation, and improved customer relationship outcomes. Kumar, Sharma and Dutot (2023) found that AI-enabled CRM capability can support service innovation, while Kumar, Ramachandran and Kumar (2020) argue that new-age technologies are reshaping marketing and relationship management practices. Ozay et al. (2024) further indicate that AI-based CRM has become an expanding field of research, with increasing attention to implementation issues, customer outcomes, and future research directions. In addition, Gnewuch, Morana and Maedche (2023) highlight the importance of human-AI collaboration in customer service, suggesting that AI should not completely replace human support but should work alongside employees to improve service quality and customer experience.

AI-CRM also strengthens customer satisfaction and retention by enabling more proactive and personalized service. Zhang, Liu and Wang (2022) show that predictive analytics can support customer retention by tailoring offers and communication based on customer profiles, while Nguyen and Brown (2023) emphasize that AI strategies can improve customer retention by identifying customer needs and reducing disengagement. Similarly, Patel and Verma (2023) demonstrate that chatbot interactions can influence customer satisfaction in AI-enabled service environments, particularly when customers receive timely, accurate, and useful responses.

In the context of the Ministry of Interior, UAE, AI-CRM can improve how customer data is collected, analysed, and transformed into actionable service improvements. It can help the Ministry anticipate customer needs, respond more quickly to inquiries, detect dissatisfaction,

personalize communication, support customer retention, and improve evidence-based decision-making. However, successful implementation requires more than technological investment. Chatterjee et al. (2019) emphasize that organizational readiness is essential for effective AI-CRM integration, while Garcia, Lee and Kim (2023) note that employee resistance to AI can limit adoption. Therefore, AI-CRM implementation in the Ministry of Interior should be supported by data governance, employee training, ethical safeguards, privacy protection, human-AI collaboration, and customer-centred service design.

2.2 AI-CRM in the Public Sector and the UAE Ministry of Interior

AI-CRM is increasingly relevant in the public sector because government institutions are expected to provide services that are efficient, transparent, responsive, secure, and accessible. In public administration, the term “customer” is not limited to buyers or commercial clients. Rather, it refers to citizens, residents, businesses, visitors, and other stakeholders who use or depend on government services. Unlike private-sector CRM, which often focuses on profitability, sales growth, and customer retention, public-sector CRM emphasizes service quality, public value, institutional trust, customer satisfaction, and effective engagement with service users.

The UAE Ministry of Interior provides an important context for examining AI-CRM because it delivers essential services related to security, policing, civil defence, traffic, licensing, emergency response, and public safety. These services require timely communication, accurate information, efficient processing, and high levels of public trust. Al-Mansoori (2023) highlights the importance of customer service dynamics in the daily operations of the UAE Ministry of Interior, showing that service quality and operational responsiveness are central to the Ministry’s public-facing role. Similarly, Almansoori and Al-Tahitah (2021) demonstrate that artificial intelligence is already relevant to decision-making processes within the Ministry of Interior in the UAE, suggesting that AI can support both operational efficiency and strategic administrative decision-making.

AI-CRM can enhance public-sector service delivery in several ways. First, it can improve service efficiency by automating routine inquiries, reducing waiting time, and supporting faster service completion. Second, it can strengthen responsiveness by providing real-time or near-real-time support through digital platforms, mobile applications, call centres, and automated service channels. Third, it can improve decision-making by analysing customer behaviour, service demand, complaints, and feedback patterns. Fourth, it can support more customer-centred service delivery by personalizing communication, identifying service needs more accurately, and providing proactive support. The value of this approach is supported by Raisch and Krakowski (2020), who explain that AI can enhance management through both automation and augmentation. In the same way, Gnewuch, Morana and Maedche (2023) emphasize the importance of human-AI collaboration in customer service, suggesting that AI should not simply replace human service agents but should support them in delivering faster and more effective responses.

In relation to customer retention and service continuity, AI-CRM can help public institutions identify service users who may become dissatisfied, disengaged, or less willing to use digital

service channels. Nguyen and Brown (2023) argue that AI strategies can support customer retention by helping organizations identify risks and respond with appropriate engagement strategies. Similarly, Zhang, Liu and Wang (2022) show that predictive analytics can support customer retention by tailoring offers and interventions based on customer profiles. In the Ministry of Interior context, this suggests that predictive analytics and retention tools can be used to identify users who experience repeated service difficulties, abandon digital transactions, or submit recurring complaints, allowing the Ministry to provide targeted support and improve satisfaction.

Chatbots and virtual assistants also have strong relevance for public-sector AI-CRM because they can provide immediate responses, guide customers through procedures, and reduce pressure on human service agents. Patel and Verma (2023) show that chatbot interactions can influence customer satisfaction in AI-enabled service environments. This is particularly important for the Ministry of Interior, where customers may require quick access to information about traffic services, licensing, civil defence procedures, emergency-related information, or application status updates. However, the effectiveness of chatbots depends on their ability to provide accurate, transparent, and reliable responses, as well as their ability to transfer complex cases to human staff when necessary.

However, AI-CRM adoption in the public sector must be implemented carefully because government institutions manage sensitive personal, legal, administrative, and security-related information. Issues such as privacy, fairness, transparency, accountability, and ethical data use are therefore central to AI-CRM success. Binns (2023) emphasizes the ethical implications of AI and data privacy, while Raisch and Krakowski (2020) caution that AI implementation requires careful management of the balance between automation and human judgment. For the Ministry of Interior, these concerns are particularly important because effective AI-CRM implementation must not only improve service performance but also protect customer trust and institutional legitimacy. Therefore, AI-CRM in the Ministry of Interior should be understood as a strategic tool for enhancing public service delivery, strengthening customer engagement, and improving customer satisfaction while maintaining responsible and ethical governance of customer data.

2.3 Customer Satisfaction in AI-Enabled Public Services

Customer satisfaction refers to the extent to which customers perceive that a service meets or exceeds their expectations. In AI-enabled public services, customer satisfaction is influenced by service speed, accuracy, accessibility, reliability, transparency, convenience, security, fairness, and responsiveness. Customers are more likely to be satisfied when government services are easy to access, information is accurate, requests are processed efficiently, and complaints are resolved effectively.

In service environments, customer satisfaction is closely linked to retention, trust, and continued use of service channels. Hassan, Shiu and Parry (2023) show that customer satisfaction plays an important role in retention strategies, while Lemon and Verhoef (2022) emphasize the importance of understanding customer experience across the full customer journey. In the public-sector context, satisfaction is not only about individual service

experience; it also affects trust in government institutions and willingness to use digital service platforms.

For the Ministry of Interior, UAE, customer satisfaction is especially important because the Ministry provides essential services that affect citizens, residents, businesses, and visitors. Satisfaction may depend on the ease of using Ministry digital platforms, the accuracy of information provided, the speed of service completion, the quality of communication, the effectiveness of complaint handling, and the perceived reliability of government systems. AI-CRM can support these outcomes by enabling faster response times, more accurate service recommendations, proactive notifications, and improved issue resolution.

AI-CRM capabilities can improve customer satisfaction in multiple ways. Predictive analytics can anticipate service demand and reduce delays. Chatbots and virtual assistants can provide instant support. Personalization can deliver relevant information based on customer needs. Churn prediction and retention tools can identify customers who may be dissatisfied or disengaged. Sentiment analysis can detect negative feedback and help institutions respond quickly. However, AI-CRM does not improve satisfaction through technology alone. Its effect is stronger when customers become more engaged with service platforms, communication channels, and feedback mechanisms.

2.4 Customer Engagement in AI-CRM

Customer engagement refers to the emotional, cognitive, and behavioural involvement of customers in their relationship with an organization or service provider. Engaged customers are more likely to interact with digital services, respond to communication, provide feedback, trust service platforms, and participate in service improvement. Kumar and Reinartz (2021) argue that customer engagement contributes to enduring customer value, while Lemon and Verhoef (2022) link customer engagement and experience to interactions across the customer journey.

In AI-CRM, customer engagement is strengthened when digital interactions become faster, easier, more personalized, and more responsive. For example, customers may become more engaged when they receive timely service reminders, obtain immediate support through chatbots, receive personalized guidance, or see that their feedback is acknowledged and acted upon. Choudhury and Kaur (2023) show that personalization can drive customer engagement, while Wang, Chen and Zhang (2023) argue that sentiment analysis can support engagement strategies by helping organizations understand customer emotions and concerns.

Customer engagement is particularly important in public-sector AI-CRM because government services increasingly depend on digital participation. Customers who are engaged are more likely to use digital platforms, complete online transactions, provide service feedback, and trust automated service channels. In the Ministry of Interior, UAE, customer engagement may involve the use of mobile applications, online service portals, chatbot interactions, feedback systems, digital notifications, and service-tracking tools.

This paper positions customer engagement as a mediating variable between AI-CRM capabilities and customer satisfaction. This means that AI-CRM capabilities may influence

customer satisfaction directly by improving service quality, convenience, and responsiveness. At the same time, AI-CRM capabilities may also influence customer satisfaction indirectly by increasing customer engagement. Therefore, the proposed framework is a partial mediation model, where customer engagement explains part of the relationship between AI-CRM capabilities and customer satisfaction.

2.5 AI-CRM Capabilities Influencing Customer Engagement and Customer Satisfaction

This section reviews the five major AI-CRM capabilities included in the proposed framework: predictive analytics, churn prediction and retention tools, chatbots and virtual assistants, personalization, and sentiment analysis. These capabilities are important because they can directly enhance customer satisfaction by improving service quality and indirectly enhance satisfaction by strengthening customer engagement.

2.5.1 Predictive Analytics

Predictive analytics involves the use of historical data, statistical techniques, and machine learning algorithms to forecast future customer behaviour, service needs, and possible service outcomes. In CRM, predictive analytics enables organizations to anticipate demand, identify customer preferences, predict complaints, detect service risks, and design proactive engagement strategies. Choudhury, Singh and Sharma (2023) describe predictive analytics as an important tool for improving CRM, while Zhang (2023) presents predictive analytics as a major driver of business and service strategy. Davenport et al. (2020) also emphasize that AI and predictive analytics are central to the future of business intelligence.

In the Ministry of Interior, UAE, predictive analytics can support proactive service delivery by identifying high-demand service periods, forecasting possible service delays, predicting complaint patterns, and sending timely reminders for renewals or required actions. For example, predictive tools can help the Ministry inform customers before a service deadline, guide them to the correct digital channel, or allocate resources to areas with expected service pressure.

Predictive analytics can directly improve customer satisfaction by increasing service efficiency, accuracy, and preparedness. It can also indirectly improve satisfaction through customer engagement because proactive communication encourages customers to interact with the Ministry before problems arise. Smith and Brown (2023) show that predictive analytics can enhance customer retention, while Jeble (2023) emphasizes that data quality is essential for predictive analytics to support customer engagement effectively.

2.5.2 Churn Prediction and Retention Tools

Churn prediction uses AI and machine learning to identify customers who may become dissatisfied, disengaged, or inactive. In commercial settings, churn usually refers to customers leaving an organization. In public-sector services, churn may be understood as disengagement from digital platforms, abandonment of online applications, repeated complaints, reduced trust, or preference for manual service channels.

Kumar, Singh and Gupta (2022) review machine learning approaches for churn prediction,

while Ngai (2022) highlights the importance of machine learning in predicting customer churn. Li, Zhao and Chen (2023) emphasize that feature engineering improves churn prediction performance, and Thompson and Lee (2023) show that data quality remains a major challenge in churn prediction. These studies indicate that churn prediction depends on accurate data, relevant customer behaviour indicators, and adaptable predictive models.

For the Ministry of Interior, churn prediction and retention tools can help identify customers who abandon digital transactions, repeatedly face service difficulties, submit unresolved complaints, or show declining use of online platforms. Lee and Chen (2023) argue that integrating customer feedback can improve churn prediction models, while Nguyen, Tran and Hoang (2023) emphasize that churn models must adapt to dynamic customer behaviour. In the Ministry context, this means that AI systems should not only identify disengagement but also support timely intervention through targeted communication, service guidance, or human support.

Churn prediction can directly improve customer satisfaction by helping the Ministry prevent dissatisfaction before it becomes more serious. It can also indirectly improve satisfaction by encouraging re-engagement with services and restoring customer confidence in digital platforms.

2.5.3 Chatbots and Virtual Assistants

Chatbots and virtual assistants are AI-powered systems that interact with customers through text or voice. They provide automated responses, answer frequently asked questions, guide users through service procedures, and support customers outside normal working hours. Khneyzer, Boustany and Dagher (2024) show that AI-driven chatbots have significant economic and managerial implications across industries, while Kumar, Singh and Gupta (2023) highlight the positive impact of chatbots on customer engagement. Lee and Kim (2023a) also discuss the future of chatbots as AI-enabled customer service tools.

In the Ministry of Interior, UAE, chatbots and virtual assistants can support customers by explaining procedures, identifying required documents, tracking applications, answering service-related questions, and directing customers to the correct service channels. These tools can improve accessibility by offering immediate assistance and reducing dependency on physical service centres or call-centre waiting times. Patel (2023) explains that AI is transforming customer service operations by improving responsiveness and service support.

However, chatbot implementation is not without challenges. Huang and Lee (2023) note that chatbots may struggle with complex queries, while Zhou, Xu and Yang (2023) identify broader challenges in chatbot implementation. Garcia and Martinez (2023) argue that transparency is important for building trust in chatbot interactions. Therefore, chatbot systems should be designed with clear communication, data privacy protection, and escalation options to human agents. Khan, Ali and Patel (2023) support hybrid customer service models that combine chatbot automation with human support. Chatbots and virtual assistants can directly improve customer satisfaction by reducing waiting time, increasing convenience, and providing continuous service availability. They can also indirectly improve

satisfaction by strengthening customer engagement through frequent, accessible, and responsive interaction.

2.5.4 Personalization

Personalization refers to the use of customer data to deliver tailored services, messages, recommendations, and experiences. AI enables personalization by analysing behavioural data, customer profiles, service history, preferences, and digital interaction patterns. Choudhury, Gupta and Singh (2022) argue that predictive analytics can support personalization and enhance customer satisfaction, while Kumar and Gupta (2022) show that data-driven personalization improves satisfaction through tailored experiences.

In the Ministry of Interior, UAE, personalization can be used to provide customized service reminders, targeted notifications, individualized guidance, and digital dashboards that reflect customer needs. For example, customers may receive reminders based on their service history, vehicle-related services, document status, or previous interactions with the Ministry. Lee, Kim and Park (2023) highlight best practices in behavioural personalization, while Lee and Kim (2023b) explain the role of AI and big data in customer experience management.

Personalization can directly improve customer satisfaction by making services more relevant, convenient, and user-friendly. It can also indirectly improve satisfaction through customer engagement because customers are more likely to interact with services that reflect their specific needs and circumstances. However, personalization must be balanced with privacy and ethical considerations. Miller and Johnson (2023) discuss the need to balance customer satisfaction with data privacy in personalization, while Nguyen and Tran (2023) emphasize the importance of balancing personalization and privacy in customer engagement.

2.5.5 Sentiment Analysis

Sentiment analysis uses artificial intelligence and natural language processing to identify emotions, attitudes, and opinions expressed in customer feedback. It can be applied to surveys, complaints, social media comments, emails, service reviews, call-centre transcripts, and other forms of customer communication. Jiang, Xu and Wang (2022) describe sentiment analysis as an important tool for measuring customer satisfaction because it enables organizations to understand whether customer feedback reflects positive, negative, or neutral experiences. Similarly, Kumar, Singh and Sharma (2023) provide a comprehensive review of sentiment analysis in customer experience management, showing that sentiment analysis can help organizations monitor customer perceptions, detect dissatisfaction, and improve service responses. Liu and Zhang (2023) also highlight recent advances in sentiment analysis techniques and applications, particularly in relation to the growing use of AI and natural language processing in digital service environments.

For the Ministry of Interior, UAE, sentiment analysis can help identify dissatisfaction, confusion, appreciation, fear, trust, or concern in customer feedback. It can also support faster responses to service problems and improve public communication. When sentiment analysis is integrated into AI-CRM, the Ministry can detect negative experiences, monitor public perception, identify recurring complaints, and recognize areas requiring service improvement.

This is particularly relevant in public-sector service delivery, where customer trust, responsiveness, and service quality are essential.

Sentiment analysis can directly improve customer satisfaction by helping the Ministry identify and address dissatisfaction quickly. It can also indirectly improve satisfaction by increasing customer engagement because customers are more likely to trust institutions that listen to feedback and respond to concerns. Wang, Chen and Zhang (2023) show that sentiment analysis can drive customer engagement strategies, suggesting that feedback analysis is not only a monitoring tool but also a mechanism for strengthening relationships with customers. Therefore, sentiment analysis is a key AI-CRM capability in the proposed framework because it connects customer feedback, service improvement, engagement, and satisfaction.

3. Theoretical Foundation of the Framework

The proposed conceptual framework is grounded in four complementary theoretical perspectives: predictive analytics theory, machine learning theory, automation theory, and customer engagement theory. These perspectives provide the academic basis for explaining how AI-CRM capabilities can influence customer satisfaction both directly and indirectly through customer engagement. Each theoretical perspective is connected to specific variables in the proposed framework, thereby strengthening the logic of the partial mediation model.

First, predictive analytics theory supports the inclusion of “predictive analytics” and “churn prediction and retention tools” as key AI-CRM capabilities. Predictive analytics assumes that historical and real-time customer data can be analysed to forecast future behaviour, service needs, dissatisfaction, and possible disengagement. In CRM, predictive analytics enables organizations to anticipate customer expectations, identify service patterns, and design proactive responses. Choudhury, Singh and Sharma (2023), Davenport et al. (2020), and Zhang (2023) demonstrate that predictive analytics strengthens CRM effectiveness by improving customer insight, strategic planning, and decision-making. In the context of the Ministry of Interior, UAE, predictive analytics can support proactive service delivery by forecasting demand, identifying likely service delays, and improving communication with service users. Similarly, churn prediction and retention tools are grounded in predictive logic because they help identify customers who may become dissatisfied, disengaged, or less willing to use digital government services.

Second, machine learning theory supports the inclusion of “churn prediction and retention tools”, “personalization”, and “sentiment analysis” in the framework. Machine learning explains how AI systems learn from data, identify patterns, and improve predictions over time. This is important in AI-CRM because machine learning algorithms can analyse customer behaviour, service history, feedback, and interaction patterns to produce more accurate insights. Kumar, Singh and Gupta (2022) and Ngai (2022) show that machine learning is central to churn prediction, while Zhang and Zhao (2023) emphasize its role in recommendation systems and personalization. In this framework, machine learning strengthens churn prediction by identifying behavioural signs of dissatisfaction, supports personalization by tailoring services and messages to user needs, and enables sentiment

analysis by classifying customer emotions and opinions from textual feedback. Therefore, machine learning provides a technical and theoretical foundation for several AI-CRM capabilities that may enhance both customer engagement and customer satisfaction.

Third, automation theory supports the role of “chatbots and virtual assistants” as AI-CRM capabilities. Automation theory explains how technology can perform routine, repetitive, and rule-based tasks with limited human intervention. In AI-CRM, automation improves service efficiency by enabling instant responses, 24/7 customer support, faster inquiry handling, automated notifications, and self-service assistance. Thompson (2023) argues that AI and automation can boost efficiency in CRM systems, while Patel, Singh and Mehta (2023) show that AI-enabled CRM can generate operational efficiency gains. In the Ministry of Interior, UAE, automation can improve customer service by reducing waiting time, supporting customers outside official working hours, and helping users navigate procedures through chatbots and virtual assistants. Thus, automation theory explains why chatbot-based and virtual assistant-based interactions may directly improve customer satisfaction and indirectly strengthen satisfaction by increasing customer engagement.

Fourth, customer engagement theory supports the mediating role of customer engagement in the proposed framework. Customer engagement theory suggests that customers who are cognitively, emotionally, and behaviourally involved in service interactions are more likely to develop positive perceptions of service quality and satisfaction. Kumar and Reinartz (2021) argue that customer engagement contributes to enduring customer value, while Lemon and Verhoef (2022) emphasize the importance of customer experience across the customer journey. In the AI-CRM context, engagement is strengthened when customers receive timely responses, personalized services, proactive updates, and evidence that their feedback is understood and acted upon. Choudhury and Kaur (2023) show that personalization can drive customer engagement, while Wang, Chen and Zhang (2023) demonstrate that sentiment analysis can support engagement strategies. Therefore, customer engagement theory explains why AI-CRM capabilities may not only affect satisfaction directly, but also indirectly by encouraging customers to interact more actively, confidently, and positively with Ministry services.

Collectively, these theoretical perspectives provide a strong foundation for the proposed partial mediation framework. Predictive analytics theory explains the role of predictive analytics and churn prediction; machine learning theory supports churn prediction, personalization, and sentiment analysis; automation theory explains the relevance of chatbots and virtual assistants; and customer engagement theory justifies the mediating role of customer engagement. Collectively, these theories explain why AI-CRM capabilities are expected to influence customer satisfaction directly and why customer engagement is expected to partially mediate the relationship between AI-CRM capabilities and customer satisfaction in the Ministry of Interior, UAE.

4. Proposed Conceptual Partial Mediation Framework

The proposed conceptual partial mediation framework, presented in Figure 1, illustrates the relationships among AI-CRM capabilities, customer engagement, and customer satisfaction

in the Ministry of Interior, UAE. The framework identifies five AI-CRM capabilities as independent variables: predictive analytics, churn prediction and retention tools, chatbots and virtual assistants, personalization, and sentiment analysis. These capabilities represent key AI-driven CRM functions that can enhance public service delivery by improving responsiveness, accuracy, personalization, feedback analysis, and proactive customer support.

Within the framework, customer engagement is positioned as the mediating variable, while customer satisfaction is the dependent variable. In this study, customer satisfaction refers to the satisfaction of citizens, residents, businesses, visitors, and other users of Ministry of Interior services with AI-enabled CRM processes and digital service interactions. The framework assumes that AI-CRM capabilities can influence customer satisfaction in two ways. First, they can have a direct effect on customer satisfaction by improving the speed, convenience, accuracy, relevance, and reliability of services. Second, they can have an indirect effect on customer satisfaction by strengthening customer engagement.

Customer engagement explains how AI-CRM capabilities translate into improved customer satisfaction. For example, predictive analytics can support proactive communication, churn prediction tools can identify disengaged or dissatisfied users, chatbots and virtual assistants can provide continuous interaction, personalization can make services more relevant, and sentiment analysis can help the Ministry respond to customer concerns. These forms of engagement can increase customers' trust, participation, responsiveness, and willingness to use Ministry services, which may subsequently improve satisfaction.

Therefore, the framework is described as a partial mediation framework because customer engagement does not completely replace the direct relationship between AI-CRM capabilities and customer satisfaction. Instead, it explains part of the mechanism through which AI-CRM capabilities enhance satisfaction. In other words, AI-CRM capabilities may directly improve customer satisfaction while also indirectly improving satisfaction through higher levels of customer engagement. This makes the framework suitable for examining both the direct and engagement-based effects of AI-CRM within the public-sector context of the Ministry of Interior, UAE.

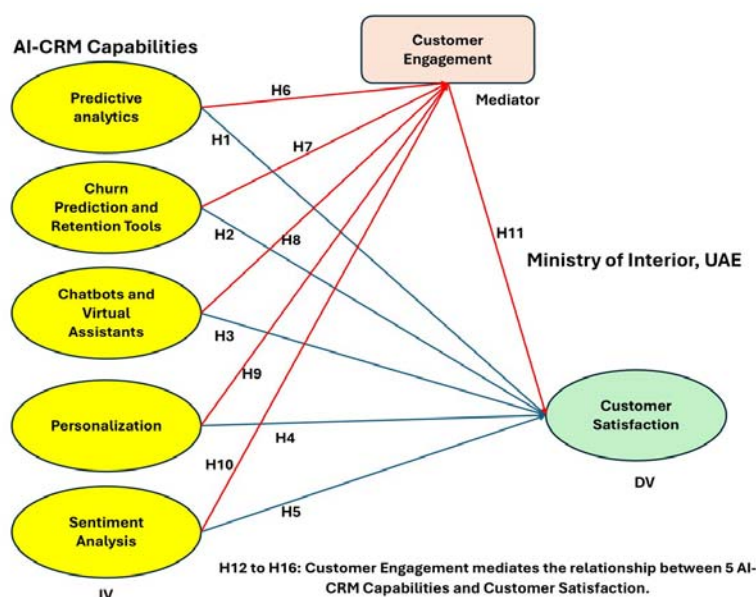


Figure 1. Conceptual partial mediation framework of AI-CRM capabilities, customer engagement, and customer satisfaction

5. Hypothesis Development

This section develops the hypotheses for the proposed conceptual partial mediation framework. The framework assumes that AI-CRM capabilities can influence customer satisfaction in two ways. First, they may have a direct effect on customer satisfaction by improving service speed, accuracy, accessibility, personalization, responsiveness, and problem resolution. Second, they may have an indirect effect on customer satisfaction through customer engagement, because AI-CRM capabilities can encourage customers to interact more actively with the Ministry's digital and service platforms.

5.1 Direct Effects of AI-CRM Capabilities on Customer Satisfaction

Predictive analytics enables organizations to use historical and real-time data to anticipate customer needs, forecast service demand, and identify potential service issues before they occur. In the Ministry of Interior, UAE, predictive analytics can improve satisfaction by supporting proactive reminders, faster decision-making, better resource allocation, and more accurate service responses. Therefore, the following hypothesis is proposed:

H1: Predictive analytics has a positive effect on customer satisfaction in the Ministry of Interior, UAE.

Churn prediction and retention tools can help identify customers who may become dissatisfied, disengaged, or inactive in using digital government services. In the public-sector context, this may include customers who abandon online applications, repeatedly complain, or avoid digital channels due to poor service experience. By identifying such customers early, the Ministry can provide targeted support and improve service recovery, which can enhance

satisfaction.

H2: Churn prediction and retention tools have a positive effect on customer satisfaction in the Ministry of Interior, UAE.

Chatbots and virtual assistants provide instant, automated, and continuous customer support. They can answer frequently asked questions, guide users through service procedures, provide application updates, support service recovery, and reduce waiting time. In the Ministry of Interior, these tools can improve customer satisfaction by making services more accessible, convenient, and responsive.

H3: Chatbots and virtual assistants have a positive effect on customer satisfaction in the Ministry of Interior, UAE.

Personalization allows AI-CRM systems to tailor communication, reminders, recommendations, and service guidance according to customer profiles, service history, and behavioural patterns. When customers receive information that is relevant to their specific needs, they are more likely to perceive the service as useful, efficient, and customer-centred. Therefore, personalization is expected to improve customer satisfaction.

H4: Personalization has a positive effect on customer satisfaction in the Ministry of Interior, UAE.

Sentiment analysis enables organizations to identify customer emotions, opinions, and concerns from feedback, complaints, surveys, and digital communication channels. In the Ministry of Interior, sentiment analysis can help detect dissatisfaction, confusion, or negative perceptions early, allowing the Ministry to respond more effectively. This responsiveness can improve customer satisfaction.

H5: Sentiment analysis has a positive effect on customer satisfaction in the Ministry of Interior, UAE.

5.2 Effects of AI-CRM Capabilities on Customer Engagement

AI-CRM capabilities are also expected to influence customer engagement. Customer engagement refers to the extent to which customers interact with, respond to, trust, and participate in service processes. Predictive analytics can enhance engagement by enabling proactive communication and timely service reminders. When customers receive relevant information before problems arise, they are more likely to interact with the Ministry's digital platforms and service channels.

H6: Predictive analytics has a positive effect on customer engagement in the Ministry of Interior, UAE.

Churn prediction and retention tools can improve engagement by helping the Ministry identify customers who are at risk of disengagement and reconnect them through targeted communication, support, and service recovery. This is particularly important in digital government services, where customers may stop using online platforms after negative experiences.

H7: Churn prediction and retention tools have a positive effect on customer engagement in the Ministry of Interior, UAE.

Chatbots and virtual assistants can increase engagement by providing customers with immediate and convenient access to information. Their availability outside normal working hours can encourage customers to interact more frequently with the Ministry's digital services.

H8: Chatbots and virtual assistants have a positive effect on customer engagement in the Ministry of Interior, UAE.

Personalization can strengthen engagement by making customer interactions more relevant and meaningful. When customers receive tailored messages, service reminders, and recommendations, they are more likely to pay attention, respond, and continue using the service platform.

H9: Personalization has a positive effect on customer engagement in the Ministry of Interior, UAE.

Sentiment analysis can enhance engagement by showing customers that their opinions and feedback are monitored, understood, and acted upon. When customers believe that their voices influence service improvement, they are more likely to provide feedback and remain involved in the service relationship.

H10: Sentiment analysis has a positive effect on customer engagement in the Ministry of Interior, UAE.*5.3 Effect of Customer Engagement on Customer Satisfaction*

Customer engagement is expected to have a positive influence on customer satisfaction. Engaged customers are more likely to interact with digital services, understand service procedures, receive timely updates, provide feedback, and develop trust in the service provider. In the Ministry of Interior, UAE, higher customer engagement can contribute to improved satisfaction because customers become more involved in the service process and experience more responsive communication.

H11: Customer engagement has a positive effect on customer satisfaction in the Ministry of Interior, UAE.*5.4 Mediating Effects of Customer Engagement*

The proposed framework adopts a partial mediation logic. This means that AI-CRM capabilities may influence customer satisfaction directly, but they may also influence satisfaction indirectly by first improving customer engagement. Customer engagement therefore explains part of the mechanism through which AI-CRM capabilities enhance customer satisfaction.

Predictive analytics may improve customer satisfaction by increasing engagement through proactive service reminders, early alerts, and relevant communication.

H12: Customer engagement mediates the relationship between predictive analytics and customer satisfaction in the Ministry of Interior, UAE.

Churn prediction and retention tools may improve satisfaction by increasing engagement among customers who are at risk of disengagement or dissatisfaction.

H13: Customer engagement mediates the relationship between churn prediction and retention tools and customer satisfaction in the Ministry of Interior, UAE.

Chatbots and virtual assistants may improve satisfaction by increasing engagement through continuous, accessible, and responsive digital interaction.

H14: Customer engagement mediates the relationship between chatbots and virtual assistants and customer satisfaction in the Ministry of Interior, UAE.

Personalization may improve satisfaction by increasing engagement through tailored services, relevant messages, and individualized customer experiences.

H15: Customer engagement mediates the relationship between personalization and customer satisfaction in the Ministry of Interior, UAE.

Sentiment analysis may improve satisfaction by increasing engagement through responsive feedback management and improved customer communication.

H16: Customer engagement mediates the relationship between sentiment analysis and customer satisfaction in the Ministry of Interior, UAE.**6. Applicability of the Framework**

The proposed conceptual partial mediation framework is applicable to the Ministry of Interior, UAE, because it provides both a research foundation and a practical guide for improving customer satisfaction through AI-enabled CRM and customer engagement. The framework can be applied in two main ways. First, it can guide future empirical testing of the relationships among AI-CRM capabilities, customer engagement, and customer satisfaction. Second, it can support managerial and operational decision-making within the Ministry by identifying how AI-CRM capabilities can be used to improve public service delivery.

6.1 Methodological Applicability of the Framework

Although this paper is conceptual, the proposed framework can be tested empirically using a quantitative research design. A survey could be conducted among customers who use Ministry of Interior services, including digital platforms, mobile applications, call centres, and physical service centres. The survey can measure customers' perceptions of AI-CRM capabilities, customer engagement, and customer satisfaction.

The main constructs in the framework are predictive analytics, churn prediction and retention tools, chatbots and virtual assistants, personalization, sentiment analysis, customer engagement, and customer satisfaction. These constructs may be measured using validated questionnaire items adapted from AI-CRM, customer engagement, and customer satisfaction literature.

Partial Least Squares Structural Equation Modelling may be suitable for testing the proposed framework because the model includes multiple independent variables, a mediating variable, and a dependent variable. Hair et al. (2019) explain that PLS-SEM is appropriate when researchers aim to test complex models, predict key target constructs, and evaluate mediation relationships.

Future empirical research can test the direct effects, indirect effects, and total effects of AI-CRM capabilities on customer satisfaction. This would help determine whether customer engagement partially mediates the relationship between AI-CRM capabilities and customer satisfaction in the Ministry of Interior, UAE.

6.2 Practical Applicability of the Framework

The framework also has practical applicability for the Ministry of Interior, UAE. It can guide the Ministry in designing, implementing, and evaluating AI-CRM systems that improve both customer engagement and customer satisfaction.

First, the Ministry should strengthen data quality because predictive analytics, churn prediction, personalization, and sentiment analysis depend on accurate, complete, secure, and reliable data. Jeble (2023) and Garcia and Patel (2023) emphasize that data quality and privacy challenges can limit the effectiveness of predictive analytics.

Second, AI-CRM systems should be designed to improve engagement, not only operational efficiency. While automation can reduce waiting time and improve service speed, the broader objective should be to create meaningful, trusted, and responsive interactions with customers.

Third, chatbot systems should be supported by transparency and human escalation. Garcia and Martinez (2023) highlight the role of transparency in building trust in chatbot interactions, while Khan, Ali and Patel (2023) support hybrid service models that combine chatbots with human support.

Fourth, personalization should be implemented ethically and transparently. Miller and Johnson (2023), Nguyen and Tran (2023), and Binns (2023) emphasize that data privacy and ethical AI are important when organizations use customer data for personalization and decision-making.

Fifth, employee readiness and organizational change management are necessary for successful AI-CRM implementation. Garcia, Lee and Kim (2023) show that resistance to AI can affect implementation success. Therefore, training, communication, and leadership support are required to ensure that employees can work effectively with AI-enabled CRM systems.

Finally, the Ministry should develop performance indicators for evaluating AI-CRM effectiveness. These indicators may include customer satisfaction score, chatbot resolution rate, complaint resolution time, customer engagement rate, sentiment score, digital service completion rate, service response time, and customer trust level.

7. Conclusion

This paper developed a conceptual partial mediation framework of AI-CRM capabilities, customer engagement, and customer satisfaction in the Ministry of Interior, UAE. The framework identifies predictive analytics, churn prediction and retention tools, chatbots and virtual assistants, personalization, and sentiment analysis as key AI-CRM capabilities. It proposes that these capabilities influence customer satisfaction directly and indirectly through customer engagement.

The framework is described as a partial mediation model because the AI-CRM capabilities are expected to have direct effects on customer satisfaction while also influencing satisfaction through customer engagement. Customer engagement therefore serves as a mediating mechanism that explains how AI-CRM capabilities can improve customer satisfaction in a public-sector service environment.

The paper contributes to AI-CRM literature by applying the concept of partial mediation to the relationship between AI-CRM capabilities, engagement, and satisfaction. It also provides a useful foundation for future empirical testing in the UAE Ministry of Interior and similar public-sector institutions.

References

- Ahmad, R., & Pande, S. (2024). *Examining the integration of artificial intelligence in customer relationship management*. <https://doi.org/10.2139/ssrn.4816041>
- Al-Mansoori, H. (2023). Customer service dynamics in the UAE: An analysis of the Ministry of Interior's daily operations. *International Journal of Public Sector Management*, 36(1), 22–35.
- Almansoori, S., & Al-Tahitah, A. (2021). The role of artificial intelligence in the decision-making process at the Ministry of Interior in the United Arab Emirates. *Journal of AlMaarif University College*, 32, 80–99. <https://doi.org/10.51345/v32i3.451.g237>
- Binns, R. (2023). The ethics of AI and data privacy. *Journal of Business Ethics*.
- Chatterjee, S., Ghosh, S. K., Chaudhuri, R., & Nguyen, B. (2019). Are CRM systems ready for AI integration? A conceptual framework of organizational readiness for effective AI-CRM integration. *The Bottom Line*, 32(2), 144–157. <https://doi.org/10.1108/BL-02-2019-0069>
- Choudhury, A., Singh, P., & Sharma, R. (2023). Predictive analytics in CRM: A comprehensive review. *International Journal of Marketing Studies*, 15(4), 67–78.
- Choudhury, S., & Kaur, P. (2023). The role of personalization in driving customer engagement: A study. *International Journal of Human-Computer Studies*, 125, 101–115.
- Choudhury, S., Gupta, R., & Singh, A. (2022). Personalization through predictive analytics: A pathway to enhanced customer satisfaction. *Journal of Marketing Research*, 59(3), 456–472.
- Davenport, T. H. et al. (2020). AI and predictive analytics: The future of business intelligence. *Harvard Business Review*.
- Dwivedi, Y. K. et al. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on

emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57, Article 101994. <https://doi.org/10.1016/j.ijinfomgt.2019.08.002>

Garcia, M., Johnson, T., & Patel, R. (2023). Overcoming barriers to effective personalization: A data management perspective. *International Journal of Information Management*, 63, 102–115.

Garcia, M., Lee, J., & Kim, S. (2023). Overcoming resistance to AI in organizations. *Management Science*, 69(2), 32–41.

Garcia, M., & Martinez, R. (2023). Building trust in chatbot interactions: The role of transparency. *Journal of Interactive Marketing*, 56, 45–60.

Garcia, M., & Patel, R. (2023). Overcoming barriers to predictive analytics: Data privacy and quality challenges. *International Journal of Data Science*, 12(1), 22–35.

Gnewuch, U., Morana, S., & Maedche, A. (2023). Towards human-AI collaboration in customer service. *Journal of Service Research*.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24. <https://doi.org/10.1108/EBR-11-2018-0203>

Hassan, L. M., Shiu, E. M., & Parry, G. (2023). The impact of customer satisfaction on retention strategies: Evidence from the service sector. *International Journal of Marketing Studies*, 15(1), 12–25.

Huang, Y., & Lee, J. (2023). The limitations of chatbots in customer service: Understanding complex queries. *International Journal of Information Management*, 65, 112–120.

Jeble, S. (2023). Data quality in predictive analytics: Implications for customer engagement. *Operations Management Research*.

Jiang, H., Xu, T., & Wang, Y. (2022). Sentiment analysis as a tool for measuring customer satisfaction. *Service Business*, 16(3), 555–572.

Khan, A., Ali, S., & Patel, R. (2023). Hybrid customer service models: Integrating chatbots with human support. *Journal of Business Research*, 142, 250–260.

Khneyzer, C., Boustany, Z., & Dagher, J. (2024). AI-driven chatbots in CRM: Economic and managerial implications across industries. *Administrative Sciences*, 14(8), 182. <https://doi.org/10.3390/admsci14080182>

Kumar, A., & Gupta, P. (2022). Data-driven personalization in e-commerce: Enhancing customer satisfaction through tailored experiences. *Journal of Business Research*, 138, 123–135.

Kumar, A., Singh, R., & Gupta, P. (2022). Machine learning approaches for churn prediction: A comprehensive review. *Journal of Data Science*, 20(3), 305–320.

- Kumar, A., Singh, R., & Gupta, S. (2023). Impact of chatbots on customer engagement. *International Journal of Information Management*.
- Kumar, P., Sharma, S. K., & Dutot, V. (2023). Artificial intelligence-enabled CRM capability in healthcare: The impact on service innovation. *International Journal of Information Management*, 69, Article 102598. <https://doi.org/10.1016/j.ijinfomgt.2022.102598>
- Kumar, V., Ramachandran, D., & Kumar, B. (2020). Influence of new-age technologies on marketing: A research agenda. *Journal of Business Research*, 125, 864–877. <https://doi.org/10.1016/j.jbusres.2020.01.007>
- Kumar, V., & Reinartz, W. (2021). Creating enduring customer value: The role of engagement. *Journal of Business Research*.
- Lee, J., & Chen, H. (2023). Enhancing churn prediction models through customer feedback integration. *Service Science*, 15(1), 67–82.
- Lee, J., & Kim, H. (2023a). The future of chatbots: Advancements in AI and customer service. *Journal of Service Research*, 26(1), 78–92.
- Lee, J., & Kim, H. (2023b). The future of personalization: AI and big data in customer experience management. *Journal of Service Management*, 34(1), 45–60.
- Lee, J., Kim, S., & Park, H. (2023). Behavioral personalization in digital marketing: Best practices. *Computers in Human Behavior*, 128, 107–118.
- Lemon, K. N., & Verhoef, P. C. (2022). Understanding customer experience throughout the customer journey. *Journal of Marketing*, 86(2), 69–96. <https://doi.org/10.1509/jm.15.0420>
- Li, X., Zhao, Y., & Chen, L. (2023). Feature engineering for churn prediction: A comprehensive study. *Expert Systems with Applications*, 215, 118–130.
- Liu, Y., & Zhang, X. (2023). Advances in sentiment analysis: Techniques and applications. *Computers in Human Behavior*, 128, 107–118.
- Miller, R., & Johnson, L. (2023). Data privacy in personalization: Balancing customer satisfaction and ethical considerations. *Journal of Business Ethics*, 178(3), 567–579.
- Ngai, E. W. T. (2022). Machine learning for churn prediction: A review. *International Journal of Information Management*.
- Nguyen, T., & Brown, E. (2023). AI strategies for customer retention: A review. *Journal of Retailing and Consumer Services*, 70, 102–113.
- Nguyen, T., & Tran, L. (2023). The balance of personalization and privacy in customer engagement. *Journal of Business Research*, 146, 538–546.
- Nguyen, T., Tran, D., & Hoang, P. (2023). Adapting churn prediction models to dynamic customer behaviour. *Journal of Business Research*, 150, 234–249.
- Ozay, D., Jahanbakht, M., Shoomal, A., & Wang, S. (2024). Artificial intelligence-based

customer relationship management: A comprehensive bibliometric and systematic literature review with outlook on future research. *Enterprise Information Systems*. <https://doi.org/10.1080/17517575.2024.2351869>

Patel, D., & Verma, S. (2023). Customer satisfaction in the age of AI: Insights from chatbot interactions. *International Journal of Information Management*, 63, 102–115.

Patel, R. (2023). AI in customer service: Transforming support operations. *International Journal of Service Industry Management*, 34(1), 45–60.

Patel, R., Singh, A., & Mehta, K. (2023). Efficiency gains from AI in CRM systems. *International Journal of Operations Management*, 14(2), 101–114.

Raisch, S., & Krakowski, S. (2020). Artificial intelligence and management: The automation-augmentation paradox. *Academy of Management Review*, 46(1), 1–48. <https://doi.org/10.5465/2018.0072>

Smith, J., & Brown, A. (2023). Integrating predictive analytics into CRM systems for enhanced customer retention. *Journal of Business Strategy*, 44(3), 67–80.

Thompson, A. (2023). AI and automation: Boosting efficiency in CRM systems. *Business Process Management Journal*, 29(3), 215–230.

Thompson, R., & Lee, C. (2023). Challenges in churn prediction: The role of data quality. *Data Science Journal*, 22(1), 1–15.

Wang, Y., Chen, Y., & Zhang, L. (2023). Customer engagement strategies driven by sentiment analysis. *Journal of Service Management*, 34(1), 78–92.

Zhang, L. (2023). Predictive analytics in CRM: A game changer for business strategy. *Journal of Marketing Research*, 60(4), 321–335.

Zhang, Y., Liu, X., & Wang, Z. (2022). Predictive analytics for customer retention: Tailoring offers based on customer profiles. *Marketing Intelligence & Planning*, 40(4), 412–426.

Zhang, Y., & Zhao, X. (2023). Machine learning in recommendation systems: A pathway to enhanced personalization. *Journal of Data Science*, 21(1), 72–85.

Zhou, L., Xu, Y., & Yang, J. (2023). Challenges in chatbot implementation. *Journal of Information Technology*.

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